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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/777,940	02/11/2004	William L. Brennenman	102426-300	5347

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WIGGIN AND DANA LLP  
ATTENTION: PATENT DOCKETING  
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EXAMINER

LAM, CATHY FONG FONG

ART UNIT	PAPER NUMBER
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1775

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.	Applicant(s)	
10/777,940	BRENNEMAN ET AL.	
Examiner	Art Unit	
Cathy Lam	1775	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on Feb. 15<sup>th</sup> 2005.
- 2a) ☒ This action is **FINAL**.      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 15-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

In view of the amendment and remarks filed on February 15<sup>th</sup> 2005, the objections to the claims have been withdrawn. The pending claims however are continued to be unpatentable as following:

***Election/Restrictions***

1. This application contains claims 15-20 drawn to an invention nonelected with traverse in paper filed on Feb. 15<sup>th</sup> 2005. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al (US 5800930).

Chen discloses a chemically treated copper foil that is laminated to a dielectric substrate. The dielectric substrate is particularly glass filled epoxy board (col 1 L 20-21).

The copper foil includes a nodular copper/nickel alloy deposited onto the surface of the copper foil (col 2 L 8-10, L 32-34). The average height of the nodules is from about 0.5  $\mu\text{m}$ - 3  $\mu\text{m}$  (col 3 L 14-16).

A chromium/zinc anti-tarnish coating is then coated to the nodulated copper foil, then laminated to the dielectric substrate (col 5 L 53-57).

The peel strength between the treated copper foil and the dielectric substrate is 11.7 lbs/in (col 5 L 56-59).

Chen teaches the present invention but is silent about the average surface roughness of the treated copper foil being  $< 0.7 \mu\text{m}$ . In the specification, applicant discloses that a minimum average surface roughness is required in order for a suitable peel strength to prevent delamination of the copper foil. Since Chen's delamination peel strength between the copper foil and the dielectric substrate is 11.7 lbs/in, inherently the average surface roughness is at least  $> 0.4 \mu\text{m}$ .

***Claim Rejections - 35 USC § 103***

1. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (US 5800930) in view of Yamanishi et al (US 5389446) or Ameen et al (US 6132589) or Poutasse III et al (US 5622782).

Chen discloses a chemically treated copper foil that is laminated to a dielectric substrate. The dielectric substrate is particularly glass filled epoxy board (col 1 L 20-21).

The copper foil includes a nodular copper/nickel alloy deposited onto the surface of the copper foil (col 2 L 8-10, L 32-34). The average height of the nodules is from about  $0.5 \mu\text{m}$ -  $3 \mu\text{m}$  (col 3 L 14-16).

A chromium/zinc anti-tarnish coating is then coated to the nodulated copper foil, then laminated to the dielectric substrate (col 5 L 53-57).

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The peel strength between the treated copper foil and the dielectric substrate is 11.7 lbs/in (col 5 L 56-59).

Chen teaches the present invention but is silent about the average surface roughness of the treated copper foil being  $< 0.7 \mu\text{m}$ .

Yamanishi discloses a copper foil for printed circuit board. The copper foil is coated on its shiny side with a zinc and/or zinc oxide and chromium oxide (col 2 L 55-59).

Ameen discloses a treated copper foil comprising of a copper foil with a layer of zinc oxide and a layer of chromium oxide (col 2 L 16-20).

The copper foil has a smooth or shiny side and a rough or matte side. The zinc oxide and the chromium oxide layer can be applied to either side or both sides of the foil (col 2 L 50-54).

Poutasse also discloses a copper foil bonded to a dielectric substrate to form a printed circuit board. The dielectric substrate is a polymeric resin substrate, such as polyimide or epoxy resin (col 2 L 30-35).

The copper foil is treated with a metallic material such as chromium, chromium-zinc alloy, zinc and/or molybdenum (col 5 L 25-29). An adhesion promoting layer such as silane compounds are coated onto the treated copper foil for bonding to the dielectric substrate (col 5 L 57-61). With the particularly silane adhesion promoting layer the peel strength increases above 4.5 lbs/in (col 10 L 5-9).

In view of the prior art teachings, one skill in the art would choose zinc, chromium and their oxides to coat onto a copper foil (either on shiny side of on rough side) and

add a silane adhesion promoting layer to increase the peel strength because zinc/chromium oxides are well known anti-tarnish coating and silane is a well know coupling agent.

Regarding to having via holes, it is obvious that a printed circuit board having a dielectric substrate with via holes because it is conventional to form via holes for electrical connections between dielectric layers in a double sided circuit board or a multilayer printed circuit board.

### ***Response to Arguments***

2. Applicant's arguments filed on Feb. 15<sup>th</sup> 2005 have been fully considered but they are not persuasive. Applicant in the remarks traverses the art rejections and raises the following issues:

- A. Chen's coating enhances laser ablation rather than inhibits it.
- B. A low surface profile (ie.  $< 0.7 \mu\text{m}$ ) is required to enhance stopping of the laser at the backside of second copper foil layer. Chen does not teach applying a coating with a relatively low average surface roughness.
- C. None of the references can be used alone or in combination that anticipate or make obvious over the present invention.

In respond to the above issues:

- A. Chen clearly teaches all the limitations of the present invention; i.e. the copper foil, the average surface roughness (implicitly taught), the average height of the nodules and the laser ablation inhibiting layer (i.e. metal/metal oxides layer).

B. Applicant is required to clarify the relationships between the average surface roughness, the average height of the nodules, the laser ablation inhibiting layer and the delamination peel strength. Applicant has not clearly make the distinction between the surface roughness which leads to a strong peel strength and at the same time the nodules have to be low profile to give a laser ablation inhibiting layer.

Applicant on page 10 lines 327-329 discloses that laser ablation inhibiting is depended upon the surface profile, the lower surface profile would enhance stopping of the laser (i.e. laser inhibiting). Applicant's disclosure (also in claims) states that the copper foil has a surface treatment as to have a surface nodular structure with an average nodule height from 0.3  $\mu\text{m}$  to 0.6  $\mu\text{m}$ .

Since Chen discloses the nodules can have an average height from 0.5  $\mu\text{m}$  to 3  $\mu\text{m}$ . Chen's coating can certainly be laser ablation inhibiting, if the height of the nodules are in the 0.5  $\mu\text{m}$  to 0.75  $\mu\text{m}$  range.

C. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

### ***Conclusion***

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cathy Lam whose telephone number is (571) 272-1538. The examiner can normally be reached on 9am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Cathy Lam  
Primary Examiner  
Art Unit 1775